



Technical Memorandum No. 2: Existing Conditions of Study Area Resources

Abstract

This technical memorandum documents the existing conditions of natural resources and the human environment within the study area of the SR 504 Feasibility Study. HDR, Inc. conducted an inventory of the environmental resources potentially affected by the extension of Spirit Lake Memorial Highway, SR 504, to state and federal roads on the eastern side of Mount St. Helens National Monument. This technical memorandum summarizes the findings of that inventory and serves as a baseline for the development of the evaluation criteria identified in Technical Memorandum No. 1.

For most resource categories, information on private lands concerning resources was extremely limited within the study area. This technical memorandum is intended to provide a broad overview of the entire study area. If this project were to proceed beyond this feasibility study, detailed evaluation of the project resources on both public and private lands would be prepared as part of an environmental impact analysis conducted in accordance with the National Environmental Policy Act.

Natural Resources

The following sections summarize the existing conditions of natural resources within the study area based on best available information from federal, state, regional, county, and local resource agencies. The information presented herein provides a general overview of the types of resources occurring in the study area and associated project planning issues. The information was not verified by field observation and is subject to interpretation. The study area, for purposes of this inventory, is bounded by State Route 503 to the south, U.S. Route 12 to the north, Forest Service Road 25, and a north-south traverse connecting the towns of Yale and Mossyrock to the west.

Aquatic Ecosystems

Water Resources

The Washington State Department of Ecology is the state agency that oversees water resources. The Department of Ecology and other state resource agencies frequently use a system of Watershed Resource Inventory Areas (WRIAs) to refer to the state's major watershed basins. The study area is located within two WRIAs, the Cowlitz (No. 26) and the Lewis (No. 27).

The northern portion of the study area lies within WRIA 26, which encompasses the Cowlitz River watershed, a subbasin of the Columbia River. The Cowlitz River watershed drains approximately 2,480 square miles of the western Cascade Range from Mount Rainer to Mount St. Helens. The river is about 133 miles in length and enters the Columbia River near Kelso, Washington.

Within the study area, Mossyrock Dam obstructs the flow of the Cowlitz River to form Riffe Lake. This reservoir, created for flood control and hydropower, impounds approximately 24 miles of the river. Downstream of Mossyrock Dam is Mayfield Dam, which creates Mayfield Lake. Neither the Mossyrock nor Mayfield Dams are passable to fish.

The Cispus and Toutle rivers occur within WRIA 26 and flow from east to west through the study area. The Cispus River enters the Cowlitz River approximately seven miles upstream (east) of Riffe Lake. The Toutle River flows into the Cowlitz River north of Castle Rock, Washington. The Toutle River originates along the west and northwest side of Mount St. Helens in two tributaries: the North Fork and the South Fork. The North and South Forks of the Toutle River were both altered significantly by mud slides and debris flows associated with the 1980 eruption of Mount St. Helens. In the years following the eruption, the U.S. Army Corps of Engineers constructed several sediment and debris retention structures to minimize the downstream migration of sediment.

The Green River is a major tributary to the North Fork of the Toutle River. This river drains the north and northeast side of Mount St. Helens. Much of the headwaters originate as high elevation mountain lakes.

WRIA 27 includes two tributaries to the Columbia River: the Lewis River and the Kalama River. These rivers flow from east to west through the study area. The Lewis River follows the southern boundary of the study area from the junction of Forest Roads 90 and 25 to Yale.

The Kalama River originates on the southwest slope of Mount St. Helens and flows southwesterly approximately 44 miles into the Columbia River, draining about 204 square miles. The upper portion of the watershed is in mountainous terrain; the lower eight miles of the river is at a moderate grade. A majority of the land use within the basin is commercial forest, and the only urban area within the basin is the town of Kalama. There is a natural barrier at river mile 10 that has a 12-foot drop. The falls were modified in the 1930s and 1950s; however, this area is passable only to spring chinook and summer steelhead (WSCC, 2000).

The Lewis River also originates in the Cascade Mountains, from an area that straddles Mount St. Helens and Mount Adams. The river flows 93 miles southwesterly to the Columbia River. The watershed drains approximately 1,050 square miles of land in Skamania, Cowlitz, and Clark counties. There are three reservoirs along the Lewis River: Swift Reservoir, Yale Lake, and Lake Merwin. The 240-foot Merwin Dam at river mile 19.5 blocks all upstream passage by salmonids (WSCC, 2000). However, bull trout are present and have been reported to spawn in reaches above the dam.

Water Quality

The Clean Water Act Section 303(d) provides a framework to identify streams that are water quality limited and, as a result, do not meet their designated beneficial uses. Beneficial uses include swimming, fishing, livestock use, and irrigation among others. If a waterbody does not meet the criteria, the Department of Ecology must include them on the 303(d) list and develop total maximum daily loads (TMDLs) for the watershed.

All waters within the state are ranked as AA (extraordinary), A (excellent), B (good), C (fair) or lake class. Specific water quality criteria have been developed for each classification. Within the study area, all rivers are classified as AA or A. This means that, at a minimum, each waterbody shall meet or exceed the requirements for all or substantially all uses (WAC 173-201A).

A majority of the streams and rivers within the study area have not been monitored extensively for water quality parameters. The waterbodies are not located in urban areas where there are typically monitoring programs. However, five stream reaches within the study area were on the 1998 303(d) list for temperature. These river segments and location of excursions are:

- Kalama River, river mile 2.8
- Green River, Green River Hatchery

- Herrington Creek, near confluence with the South Fork of the Toutle River
- Iron Creek, near confluence with the Cispus River
- Cispus River, downstream of Iron Creek.

Federal Threatened and Endangered Species

The Endangered Species Act (ESA) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) administer the Act under the Department of Commerce and Department of the Interior, respectively. NMFS is generally responsible for marine species, anadromous fish, and sea turtles while they are in the water, but not birds. USFWS is responsible for birds, terrestrial and freshwater species, sea otters, and sea turtles while they are on land.

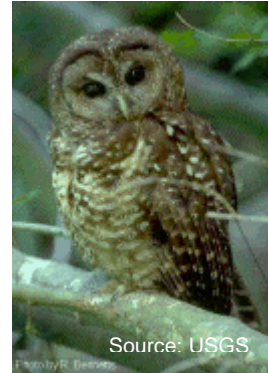
Three categories of listings are recognized by the agencies: proposed, threatened, and endangered. If a species is listed as *threatened* or *endangered*, then USFWS or NMFS must be consulted if an action “may affect” a listed species. If a species is *proposed*, then a conference with USFWS or NMFS would be required if the action is likely to “jeopardize the continued existence” of the species.

Within the study area there is the potential for habitat and/or presence of federally listed or proposed species. These species were identified through recovery plans, listing summaries, inventory/status reports, and conversations with agency personnel. Species or habitat that may be within the study area are the spotted owl; Canada lynx; brown bear; gray wolf; bull trout; chinook, chum, coho, and steelhead salmon; water howellia; Bradshaw's lomatium; and Nelson's checkermallow. The habitat, known distribution, and species biology are discussed below.

In addition to the federally listed species discussed in detail below, the U.S. Forest Service (USFS) provides management direction of 346 rare and little-known species closely associated with late-successional or old-growth forests in its “Survey and Manage” mitigation measures of the Northwest Forest Plan (USFS, 2000). The species are primarily bryophytes (mosses and liverworts), fungi, lichens, mollusks (snails and slugs), amphibians (salamanders), and vascular plants (plants with stems) and are to be protected through survey and management standards and guidelines set forth in the plan. A key factor in this management element of the plan is the requirement to conduct pre-disturbance surveys for the survey and manage species. Survey protocols and management recommendations developed for these species provide brief descriptions of the objectives of surveys.

Northern Spotted Owl (*Strix Occidentalis caurina*)

The northern spotted owl is listed as threatened under the ESA. This medium sized owl reaches 12 to 16 inches in length and has a wingspan of 42 inches. The male and female of this species are similar in size and coloration. This species is nocturnal but will be active during the day if stimulated. These resident birds are cavity nesters and raise a brood of one to two young approximately every other year. This species mates in spring (March through April) with gestation and fledging lasting approximately one month each. The primary food source of the northern spotted owl is small mammals, including the northern flying squirrel and the dusky woodrat.



Habitat associated with spotted owl nesting and roosting are forests with a high percentage of canopy cover and an open understory that is suitable for flying. Foraging habitat can include a variety of forest types. The roosting and foraging range for the owl can be up to a 2.5-mile radius from the nest tree. Contiguous parcels of forestlands with canopy cover are required for owl dispersion. Specific habitat types associated with this species are spruce/hemlock/cedar forest, cedar/hemlock/Douglas-fir forest, and the Douglas-fir forest.

Within the USFS lands, the USFS has designated owl habitat areas (Attachment 1).

Gray Wolf (*Canis lupus*)

The gray wolf is an endangered species protected under the ESA. The gray wolf is a member of the dog family (*Canidae*). Adult males and females can weigh between 75 to 100, and 55 to 85 pounds, respectively.

Including the tail, males are approximately 5 to 6 feet long, and they stand about 30 inches tall at the shoulder. Wolves can be several colors including red, brown, gray or white.



Wolves begin mating when they are 2 to 3 years old. On average, five pups are born in early spring and are reared in the den for the first 6 weeks. They depend on their mother's milk for the first month, then they are gradually weaned and fed regurgitated meat brought by other pack members.

Wolves run in packs of typically two to eight individuals, led by an alpha male. Each pack has a territory of 50 to 5,000 square miles depending on food source availability. Wolves are habitat generalists and only food sources and human tolerance limit their presence. Wolves typically eat larger game animals such as deer, elk, and antelope, but will consume smaller prey as well.

Historically, wolves were present throughout most of the lower 48 states. Currently, there are wolf populations in the northwest within the states of Montana, Wyoming, and Idaho. A small population of gray wolves may live in the northern cascades (WDFW 2000). USFS at Gifford Pinchot National Forest (GPNF) has mapped potential gray wolf habitat (Attachment 1). This mapping combined road densities and areas most likely to support big game. Habitat that may support the gray wolf outside of the GPNF is unknown at this time.

Canada Lynx (*Lynx canadensis*)

The Canada lynx was listed as threatened under the ESA in April 2000. This species is a medium sized land mammal in the cat family. The lynx appears brown to gray in color and has black markings on face and ears. Other characteristics of this species include long fur, facial



tuffs, a short tail, long limbs, and large feet. The sexes of these species are similar, with the males slightly larger than the females. The average male weighs 22 pounds and is 33.5 inches long (WDFW, 2000a).

This species mates in early spring (March through April) and litters typically consist of two to six kittens. Dens are typically found in mature forest stands with downed material. The lynx's food sources include the snowshoe hare, small mammals, and carrion.

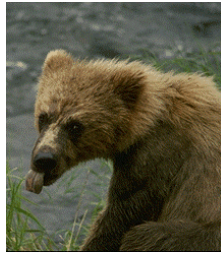
Habitats associated with the lynx include the higher elevation sub-alpine and boreal forests. This species has readily adapted to snow conditions, using the long limbs and large foot size to maximize agility. Home range for the lynx is dependent on food availability, but average daily travel is from 3 to 5 miles (WDFW, 2000a).

In the western states, the Canada lynx was historically found throughout large portions of Canada and in Alaska. In Washington, lynx sightings have been reported in the Cascade Mountains as far south as Mount

Adams. Recent sightings have been reported in eastern Skamania and Lewis counties.

The USFS has developed and mapped potential breeding and foraging habitat for Canada lynx based on elevation and vegetative communities. This habitat is shown in Attachment 1. There is no known habitat or known lynx presence outside of USFS boundaries.

Grizzly Bear (*Ursus arctos horribilis*)



The grizzly bear was listed as threatened under the ESA in 1975. This species is a large land mammal, with males ranging between 300 to 600 pounds, and females weighing up to 400 pounds. Grizzly bears typically remain on all fours while moving, but will stand to survey the surrounding environment reaching a height of up to 7 feet. This species coloration can range from brown to black, and can be confused with the black bear. However, the grizzly has smaller ears, high humped shoulders, a concave face, and long front claws.

Grizzly bears emerge in late spring and mate in June through July. The remaining summer is spent foraging for food. This species is omnivorous, obtaining 80 to 90 percent of its diet from berries, nuts and roots. The remaining portion of the diet is carrion, and insects. Members of this species begin to hibernate in underground dens in late fall and remain there until emergence in spring. In January, females bear one to three young, but remain in the den until spring emergence. The cubs remain with the mother for 2 to 3 years before dispersing. Grizzly bears typically do not reach mating maturity until they are 5 years old.

The home range for the grizzly bear can be anywhere from 50 to 500 square miles. The range will encompass a wide range of habitats and elevations. This species may forage at lower elevations in meadows and grasslands and hibernate in forested systems at higher elevations.

Historically, the grizzly bear was found throughout areas in the western lower 48 states from the Great Plains to California (USFWS, 1993). Currently the grizzly bear presence is known in the northern Cascade Range in Washington and southern Canada, as well as Montana and Wyoming. There is no current documented presence of grizzly bears within the study area, or within GPNF, and the area is not a USFWS designated recovery area (USFWS, 1993). However, GPNF has mapped parcels of potential habitat (Attachment 1). This mapping effort combined habitat, elevation range, and road densities to estimate the potential habitat.

Bradshaw's Lomatium (*Lomatium bradshawii*)



Bradshaw's lomatium is listed as endangered under the ESA. This member of the parsley family grows from eight to 20 inches tall. The basal leaves are fine and divided into linear segments. The compact yellow flowers are present from April through May, with fruits appearing in May and June. The fruits are oblong, about one-half inch long, thick-

winged along the margin, and have thread-like ribs on the dorsal surface (OSU, 2000).

The majority of Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, adjacent to creeks and small rivers (USFWS, 1993a). This species has been found throughout the Willamette Valley of Oregon and as far north as Clark County, Washington.

Bradshaw's lomatium has not been documented within the study area. However, there may be suitable habitat within the study area.

Water Howellia (*Howellia aquatilis*)

Water howellia was listed as a threatened species in 1994 under the ESA. As the name implies, this is an aquatic species found in lakes and ponds.

Howellia aquatilis is an annual branched herb that has submerged or floating stems up to 24 inches in length. The leaves of this species are long and narrow (up to 2 inches) and are alternate or whorled. Two types of flowers are produced: small, inconspicuous flowers beneath the water's



surface, and emergent white flowers 0.08-0.11 inches in length. The plant is predominantly self-pollinating, and each fruit contains up to five large brown seeds up to 1.5 inches long (USFWS, 1994).

Water howellia reproduces entirely from seed, and germination only occurs when ponds dry out and the seeds are exposed to air.

Consequently, this species is typically found in habitats that have an annual cycle of drawdown from one to two feet (Thomas, 2000). This species grows in firm consolidated clay and organic sediments that occur in wetlands associated with ephemeral glacial pothole ponds and former river oxbows.

This species has the potential to occur throughout the state, as populations have been documented from Montana east to the Willamette Valley in Oregon and south to California. To date there has been no documented

presence of water howellia within the study area, however there is potential habitat (Thomas, 2000).

Nelson's Checkermallow (*Sidalcea nelsoniana*)

Nelson's checkermallow was listed as threatened under the ESA in 1993. This species is a perennial herb that grows approximately 12 to 30 inches tall. This plant has lavender to pink flowers that bloom from May through August. The flowers are either perfect (male and female) or pistillate (female). The flowers are clustered along inflorescences that are spiked and slightly open.



Nelson's checkermallow is typically found in remnant prairie and wet meadows. This species has been found from the southern Willamette Valley of Oregon north to Cowlitz County, Washington. Soils series that have been associated with this species in Oregon include the Wapato, Mcalpin, Bashaw, Malabon, Coburg, and Salem soils (USFWS, 1993b).

Bull Trout (*Salvelinus confluentus*)

The Columbia River Distinct Population Segment of bull trout is listed as threatened under the ESA. This species looks similar in appearance to other trout, including the lake and brook species; however, the bull trout lacks dark markings on its dorsal fin. Bull trout is especially difficult to distinguish from Dolly Varden (*Salvelinus malma Walbaum*). Dolly Varden tend to have a more rounded body shape while bull trout have a larger, more flattened head and a more pronounced hook on the lower jaw. In addition to looking similar, these species also have parallel biology and behaviors. Some scientists believe that one of the distinguishing characteristics of bull trout is that they do not migrate to saltwater. However, Washington biologists have recently found bull trout in Puget Sound (WDFW, 2000).

Adult bull trout will range from 11 to 22 inches, depending on their life cycle and food source. The main diet of bull trout consists of terrestrial and aquatic insects.

Bull trout exhibit two basic life history strategies as adults: resident and migratory. Migratory bull trout live in larger rivers (fluvial) or lakes (adfluvial) and migrate to small stream headwaters to spawn. Bull trout spawn from the end of August through



November. Females construct redds (nests) at the downstream end of pools where water is clear and a fine gravel substrate is available. Eggs incubate over the winter and hatch in late winter or early spring and emergence typically occurs after a peak in stream discharge from early April through May (University of Idaho, 2000).

As juveniles, resident and migratory forms occur together but it is unknown if they represent a single or separate population. Among migratory forms, out-migration generally occurs at age two but ranges of one to three years have been observed.

According to the WDFW, small populations of bull trout have been found in the Lewis River basin in Lake Merwin, Yale Lake, and Swift Reservoir. The various dams have interrupted passage between and spawning in the reservoirs. Spawning is known to occur in Cougar Creek, a tributary to Yale Lake, as well as in two tributaries to the Lewis River: Rush and Pine creeks (WDFW, 1998). The USFS has identified suspected bull trout habitat in the Upper Cispus River (USFS, 2000a).

Salmon

There are four salmonid species located within the study area that have been listed as threatened or endangered under the ESA. The recovery and listing of these species fall under the jurisdiction of NMFS. Salmon species that are present in the study area and their Evolutionary Significant Unit (ESU) and status are listed in Table 1. An ESU is a distinctive group of salmon or steelhead that have adapted to a particular area. ESUs are typically delineated on a large watershed basis. A summary of the characteristics of each species follows. The life history of these species is outlined in Table 2.

Table 1. Status of ESA Protected Salmon Species

Common Name	Scientific Name	ESU	Status
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Lower Columbia River	Threatened
Chum Salmon	<i>O. keta</i>	Columbia River	Threatened
Coho	<i>O. kisutch</i>	Lower Columbia River/ SW Washington	Candidate
Steelhead	<i>O. gairdneri</i>	Lower Columbia River	Threatened

Table 2. Species Life History

Fish Species	Age at Maturity, yrs	Weight, lbs	Time in Fresh Water, yrs	Time in Ocean, yrs	Time of Adult Migration	Spawning Time	Egg Incubation	Downstream Migration
Chum Salmon	3-4	8-12	Dec-May	2-3.5	Sep-Dec	Sep-Jan	Sep-Mar	Dec-May
Coho Salmon	3	5-20	1+	2	Oct-Jan	Sep-Mar	Sep-Apr	Mar-Jul
Fall Chinook Salmon	3-5	15-40	1 yr.	2-5	Aug-Dec	Sep-Jan	Sep-Mar	Apr-Jun
Spring Chinook	4-6	10-20	1+	2-5	Jan-May	Late Jul - Late Sep	unknown	During 2nd spring and summer
Summer Chinook	4-6	10-30	1+	2-5	Jun-Aug	Sep-Nov	unknown	During 2nd spring and summer
Summer Steelhead	3-6	8-20	1-2	2-4	Jun-Aug	Feb-May	Feb-Jun	Mar-Jun
Winter Steelhead	3-6	5-28	1-3	1-4	Nov-Jun	Feb-Jun	Feb-Jul	Mar-Jun

Source: Bell, Milo C. " Fisheries Handbook of Engineering Requirements and Biological Criteria"

Chinook. Chinook are classified into spring, summer, and fall categories based on the timing of their migration and spawning. Spring chinook will spawn in the upper tributaries of the Columbia River; summer chinook will use medium to large rivers; and fall chinook will spawn at the lower portions of large rivers and in the mainstem Columbia River.

Chinook salmon do not feed during the freshwater spawning migration, so their condition deteriorates gradually during the spawning run as they use stored body materials for energy and for the development of reproductive products. Juvenile chinooks in fresh water feed on plankton, then later eat insects. In the ocean, they eat a variety of organisms including herring, pilchard, sandlance, squid, and crustaceans.

Chum. Chum have the widest distribution of any of the Pacific salmon. They range south to the Sacramento River in California and the island of Kyushu in the Sea of Japan. In the north they range east in the Arctic Ocean to the Mackenzie River in Canada and west to the Lena River in Siberia (ADFG, 2000).

Chum salmon often spawn in small side channels and other areas of large rivers where upwelling springs provide excellent conditions for egg survival. Chum do not have a period of freshwater residence after emergence of the fry as do chinook, coho, and sockeye salmon. Chum fry feed on small insects in the stream and estuary before forming into schools in salt water where their diet usually consists of zooplankton.

Coho. Coho are extremely adaptable and occur in nearly all accessible bodies of fresh water - from large watersheds to small tributaries. This species has been able to adapt to the specific conditions of their natal streams. In streams with varying temperatures or natural barriers such as falls, coho may return early or late in the migration season to compensate for these factors. The emergent fry occupy shallow stream margins, usually among submerged woody debris (in quiet areas free of current) from which they dart out to seize drifting insects (ADFG, 2000).

During the fall, juvenile coho may travel miles before locating off-channel habitat where they pass the winter free of floods. Some fish leave fresh water in the spring and rear in brackish estuarine ponds and then migrate back into fresh water in the fall.

Steelhead. Steelhead are similar to a rainbow trout in habitat and physical appearance. However, steelhead are anadromous, while rainbow trout are resident fish and steelhead are typically more silvery and slender than resident rainbow. Like rainbow, the coloration on the back is basically blue-green shading to olive with black, regularly spaced spots.

Steelhead are typically classed as spring, summer, fall, and winter, again pertaining to the time of year that steelhead return to spawn. Steelhead have overlapping habitats and spawning locations, but just vary their time of return. Steelhead often return to their natal stream months before spawning. Steelhead, unlike the salmon can spawn more than once. A male may spawn with several females, and more males than females die during the spawning period. The ragged and spent spawners move slowly downstream to the sea, and the fish begin to feed again. On rare occasions a fish will return to the stream within a few months, but most repeat spawners spend at least one winter in the sea between spawning migrations.

Distribution. As indicated in Table 2, salmon have species-specific timing requirements for migration, spawning, and rearing. In addition, the fish have varying abilities to pass structures or falls, as well as various water velocity requirements and habitat preferences. For this reason there are some watersheds or river reaches that may support one species, or season (i.e. spring chinook) of salmon and not another. The historic distribution of salmon is shown in Attachment 2 and the known current distribution by major watershed is summarized below. The information was gathered from inventory studies by WDFW and Salmon Limiting Factors Analysis completed by the Washington State Conservation Commission.

Lewis River

Historically the Lewis River supported all four of the listed salmon stocks. However, the 240-foot Merwin Dam at river mile 19.5 now prevents any upstream passage. Therefore, known chum distribution is within the mainstem Lewis River, downstream from the dam. The mainstem Lewis River below the dam and Cedar Creek also support populations of coho, chinook, and steelhead.

Kalama River

The Kalama River has a natural fall at river mile 10. Even with a fish ladder added in the 1950's, anadromous passage is still limited. Spring chinook and steelhead are able to pass the falls. These populations are able to use the entire mainstem and portions of tributaries throughout the watershed for spawning and rearing. The mainstem below the falls supports chum, coho, and fall chinook.

Green River

Green River supports native populations of fall chinook, coho, and winter steelhead. These species use the mainstem and some tributaries such as Elk and Devils creeks. Historically the Green River is not known to provide habitat for spring chinook, summer steelhead, or chum.

North Fork of the Toutle River

Within the study area, the North Fork of the Toutle River does not currently support any salmonid species. Historically most of the watershed supported anadromous fish, with the exception of chum. The 1980 eruption of Mount St. Helens naturally reduced the habitat availability. A sediment retention structure near the mouth of the North Fork was designed to collect and pass fish over the dam. However, this task can not be accomplished during periods of high sediment loads passing the structure. The passing of the sediment loads are typically in the fall and correspond with coho and winter steelhead returns (WSCC, 2000).

South Fork of the Toutle River

The entire mainstem and most tributaries of the South Fork of the Toutle River support coho, winter steelhead, and spring and fall chinook. There is little documented presence of chum in the South Fork of the Toutle River. However, this species is assumed to spawn in the lower mainstem of this river below Johnson Creek.

Cowlitz River

Historically, the entire mainstem of the Cowlitz River and tributaries above the Toutle River supported chinook, coho, chum, and steelhead. However, the Mayfield Dam eliminated spawning

habitat to these species. There are no naturally spawning salmonids above river mile 52.

Wetlands

Wetlands are systems that provide water quality, wildlife habitat, and other environmental functions. Wetlands can either be hydraulically connected to water bodies such as rivers and lakes, or isolated areas caused by topographic depressions. Wetlands are defined by hydrophytic vegetation, hydric soils, and a regular hydrologic regime. The removal or fill of wetlands falls under Section 404 of the Clean Water Act and is overseen by the U.S. Army Corps of Engineers.

National Wetlands Inventory (NWI) mapping was prepared by the USFWS using aerial photographs. NWI maps provide a preliminary indication of wetlands in an area. NWI mapping is not exact or inclusive of all wetlands in an area, and field reconnaissance and verification is typically performed to provide a more detailed assessment of wetlands in a specific area. For purposes of this inventory, NWI maps were used to represent a baseline of wetland resources in the study area

Attachment 3 shows the location of wetlands in the study area as identified in the NWI maps. The study area supports all classifications of wetlands with the exception of estuarine.

Vegetation and Priority Habitats

There are six designated vegetative communities within the study area, as indicated in Attachment 4. These communities were characterized by WDFW using satellite imagery and information provided by resource personnel. One or more of these communities constitute habitat for a variety of species.

WDFW is currently developing mapping that identifies the range and distribution of 130 marine, inland, and aquatic species. In addition, WDFW is documenting the use and type of habitat of up to 650 species. This will allow the cross-reference between vegetative communities and species that are known to use the habitat type. WDFW estimates that this task will be completed by February 2001.

WDFW has identified priority habitats within the state that the agency feels deserves special consideration in project development. Habitats that may be located within the study area are summarized in Table 3. These habitats were identified based on the functions of the system. The riparian habitat is given a priority designation because this habitat provides benefits to multiple aquatic, terrestrial, and avian species. The cave and

talus habitats are defined as priority because these are limited in quantity and typically support special status species such as the Townsend's big-eared bat (*Corynorhinus townsendii*), larch mountain salamander (*Plethodon larselli*), and peregrine falcon (*Falco peregrinus*). Special status species are species that the natural resource agencies are monitoring and for which protective measures or management guidelines are being developed.

Table 3- Summary of Priority Habitat possibly within Project Area

Habitat Type	Description
Caves	A naturally occurring cavity, recess, void, or system of interconnected passages. Caves are at least one foot in diameter and measure at least three feet in depth.
Cliffs	Greater than 25 ft high and occurring below 5000 ft.
Instream	The physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and invertebrate resources.
Oak Woodlands	Pure or mixed stands of oak or oak savannah greater than or equal to 5 acres.
Old-growth / Mature forests	These forest usually have stands of at least 36 acres and provide habitat for many species.
Prairie	Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.
Riparian	The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
Snags	Areas that are characterized by the presence of snag numbers and sizes comparable to, or exceeding mature forests.
Talus	Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings.
Urban Natural Open Space	A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other <i>priority habitats</i> ; and/or the open space is an isolated remnant of natural h
Wetlands	Wetlands that support diverse and numerous plant and animal species.

Source: Washington State Department of Fish and Wildlife

In addition to the WDFW priority areas, deer and elk wintering habitats are also important because they provide forage and cover to sustain the herd through the winter months. Suitable deer and elk wintering habitat as mapped by the USFS are located in Attachment 5. Wintering habitat outside of forest boundaries is not known at this time.

Cultural Resources

Cultural resources are the physical manifestations of the past activities of humans. The National Historic Preservation Act (NHPA) of 1966 was enacted to protect historic places “significant to the Nations’ heritage.” The National Register of Historic Places (NRHP) is an inventory of the United States’ cultural resources and is maintained by the National Park Service. The inventory includes buildings, structures, objects, sites, districts, and archeological resources.

The State of Washington has a listing process, similar to the federal process, in which sites within the state are placed on the Washington Heritage Register. A site can be listed under one or both of the registers. Numerous sites that are potentially eligible for listing have been identified, but have not been subject to field investigation and evaluation. Two sites adjacent to the study area in Lewis County are listed in the NRHP and the Washington Heritage Register. These sites are the Randle Ranger Station - Work Center and the North Fork Guard Station No. 1142, both located in the Gifford Pinchot National Forest (WDCTED, 1999).

Records of identified archeological sites within the study area are maintained by the State Historic Preservation Officer (SHPO). Numerous sites have been identified in the Mount St. Helens National Volcanic Monument and the Gifford Pinchot National Forest. However, the specific archeological sites within the study area were not considered in this inventory because the relatively wide corridors (i.e., one mile) of the option alignments would not provide accurate indications of the potential effects on specific sites. The specific locations will be important in refinement of a preferred option, when chosen.

Wild and Scenic Rivers

Federally designated Wild and Scenic Rivers are defined as those rivers that possess outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values. These rivers are to be preserved in free-flowing condition and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

There are no federally designated Wild and Scenic Rivers in the study area. However, the GPNF Forest Plan recommends the Lewis River, Cispus River, and the Muddy Fork and Clear Fork of the Cowlitz River be considered for designation as Wild and Scenic Rivers (see Table 4). Additionally, twelve other rivers (see Table 5) in the Forest are recommended for further study with respect to their designation as Wild and Scenic Rivers.

Table 4. Rivers Recommended for Wild and Scenic Designation

River	Classification Recommendation	Miles Within GPNF	Total Miles
Lewis River	Wild	4.0	4.0
	Scenic	20.0	29.0
	Recreational	0.0	1.5
Cispus River	Wild	6.8	6.8
	Scenic	39.7	45.2*
Muddy Fork – Cowlitz River	Wild	5.0	10.0
	Scenic	1.0	1.5
Clear Fork – Cowlitz River	Wild	5.0	5.0
	Scenic	10.0	10.0
*Does not include approximately 1.5 miles within the project boundary of the Cowlitz Falls Hydroelectric Project (FERC Project No. 2833), as licensed.			

Source: GPNF Forest Plan

Table 5. Rivers Eligible for Further Study for Wild and Scenic Designation

River	Classification	Miles Within GPNF
Clear Creek	Wild	6.3
	Scenic	4.2
Green River	Wild	6.1
	Scenic	4.0
Ohanapecosh River	Scenic	3.0
Quartz Creek	Wild	7.7
	Scenic	1.8
Siouxon Creek	Wild	11.3
Smith/Muddy	Wild	13.4
	Scenic	12.5
Toutle	Wild	11.3
White Salmon	Wild	7.4
	Scenic	13.3
Yellowjacket Creek	Wild	7.0
	Scenic	1.3
Cowlitz	Recreational	1.0
East Fork Lewis River	Wild	10.9
	Recreational	0.0
Wind River	Scenic	9.5

The river corridor values making them eligible for recommendation as Wild and Scenic Rivers are being protected through forest management practices until Congress takes action on the GPNF's recommendation or further studies are completed. The GPNF monitors activities in each river corridor to ensure that the rivers' wild and scenic values are protected consistent with the Wild and Scenic Rivers Act.

Land Management

The study area is located in Lewis, Skamania, and Cowlitz counties, which are largely rural in character. The GPNF comprises the majority of the study area. WDNR is also a major landowner in the area. Relatively large portions of the study area outside the GPNF are owned by private timber and forestry interests, such as Weyerhaeuser. Attachment 6 depicts land ownership in the study area.

Land use and management in the GPNF is guided by its 1990 Forest Plan and subsequent amendments. Forest plans for all National Forests are required by the National Forest Management Act. These plans establish land management areas – and the goal and objectives and standards and guidelines for land management – for use by land managers, other government agencies, private organizations, and individuals. GPNF's first Forest Plan was published in 1990 and has been amended several times since then. Notably, as a result of the 1994 Northwest Forest Plan, the Plan was amended in 1995 to incorporate a comprehensive ecosystem management strategy.

The Northwest Forest Plan and amendments provide detailed information on land allocations (specific management areas) and the specific land use and management requirements for those allocations. Within the study area, key management areas include the Mount St. Helens National Volcanic Monument, inventoried late successional reserves, roadless areas, and the Goat Marsh Research Natural Area.

Under the Northwest Forest Plan, the USFS has survey and management requirements that provide protocols for any ground disturbing activity. The protocols include seasonal restrictions on construction and restrictions on the project location to protect wildlife.

The Mount St. Helens National Volcanic Monument is further managed according to the Comprehensive Management Plan (CMP), which delineates specific management concept areas within the National Monument and provides objectives for management within the National Monument.

The Mount St. Helens National Volcanic Monument offers unique research opportunities not found elsewhere. There are hundreds of research activities in the Monument – some of which have been ongoing for over 20 years. Approximately \$10 million have been invested in scientific research at the Monument. The center of research activities is on the north side of Mount St. Helens, between Spirit Lake and Coldwater Lake. Some activities occur in the Green River drainage and several other projects occur throughout the remainder of the area (USFS, 2000b).

Cowlitz and Lewis counties have adopted land use plans and zoning ordinances that guide land use within those jurisdictions.

Recreation

Recreational opportunities in the study area include hiking, camping, fishing, hunting, mountain biking, boating/canoeing, climbing, horseback riding, and nature study, as well as winter recreation activities such as cross-country skiing, snowshoeing, and snowmobiling.

Developed recreational facilities are available in GPNF and the Mount St. Helens National Volcanic Monument. Hiking trails are located throughout the National Monument and GPNF. Interpretive centers and visitor facilities in the study area include the Coldwater Ridge Visitor Center and the Johnston Ridge Observatory. Campgrounds are located east and south of the National Monument at Beaver Bay, Cougar, Merrill Lake, and Kalama Horse Camp. Road access to recreational facilities is provided by SR 503, SR 504, and Forest Roads 25, 81, 83, 90, 99, 830, and 8123. Attachment 7 illustrates the recreational facilities in the Mount St. Helens National Volcanic Monument vicinity.

Four Sno-Parks are located within the study area. The Sno-Park program is administered by Washington State Parks and provides cleared parking areas for winter recreationists. Sno-Parks provide access to study area snow trail systems used by cross-country skiers, snowshoers, and snowmobilers. Winter climbing of Mount St. Helens is permitted.

Opportunities for semi-primitive and primitive recreation are also available in the study area.

The GPNF Forest Plan and the Mount St. Helens National Volcanic Monument Comprehensive Management Plan provide management guidance for recreational uses. Most facilities in the study area are subject to a user fee.

Geology

The bedrock in the study area consists mainly of volcanic and volcanoclastic rocks of Tertiary age. These rocks include andesite flows and pyroclastic and sedimentary units such as ash-flow and air fall tuffs, tuff breccia, volcanic siltstone, sandstone and conglomerate. Quaternary basalt flows may be encountered in places, especially south of Mount St. Helens, where the Marble Mountain flows cover a portion of the area southeast of the mountain. Bedrock exposures are found mainly along the stream and river bottoms, where overlying glacial materials have been

stripped by erosion. These rocks can be classified as of good to poor quality with respect to roadway engineering, depending on local conditions. Poor quality areas are characterized by hydrothermal alteration, weathered horizons and/or deep weathering, and unfavorable bedding and jointing orientation. Good quality areas are characterized by relatively unweathered rock and rock having more widely spaced and favorably oriented bedding and jointing.

Most of the northern portion of the study area is underlain by glacial till material of Hayden Creek age (140,000 year BP), which predates the modern development of Mount St. Helens. These materials were deposited by an ice cap that was centered in the area around the present location of Spirit Lake. The ice cap also covered the divides between Toutle River, Green River and Cowlitz River drainages in the study area. These deposits are generally thin and overlie Tertiary bedrock where the till base is visible. The material is weathered to a depth of 2.5 to 3.5 meters. The unit includes glacial lacustrine deposits along the Green River and between the Green River and the North Fork of the Toutle River, especially on Maratta and Hoffstadt creeks. The lake sediments are reported to be very unstable and unsuitable as subgrade for road construction. Areas of glacial till deposits from the most recent glaciation surround Mount St. Helens on the south and west, but are of limited extent. Till materials, particularly where weathered and recently disturbed, are potentially vulnerable to landslides of the shallow-rapid and debris flow types. Where fresh and undisturbed, the dense, massive glacial materials tend to be stable.

The southern portion of the study area has been affected by the 1980 and earlier eruptions. In the North Fork of the Toutle River drainage, deep, unstable lahar deposits from 1980 occur. South of Spirit Lake, pyroclastic material and tephra deposits are found. Smaller lahar or mudflow deposits from 1980 are present in the South Fork of the Toutle River drainage, west of Mount St. Helens, and in the Smith Creek/Muddy River drainage, east of Mount St. Helens. Older lahar and pyroclastic deposits are mapped in most of the drainages along the southwest and south sides of the mountain.

Landslide activity is reported to be common in the study area, and landslide deposits occur in many areas. During the development of the initial portion of SR-504, landslides were found below Hoffstadt Mountain, at Hoffstadt Creek and at Maratta Creek. Similar landslide areas are likely to occur throughout the study area.

Volcanic activity and other geologic processes are ongoing at Mount St. Helens. These activities primarily affect the area below the crater, Spirit Lake, and the debris avalanche area to Coldwater Lake. Within the past few years, these areas have experienced mud flows, flooding, unstable

streams, and landslides. For example, a rain event in September 1997 resulted in a mudflow on the north side of the mountain (USFS, 2000b).

Aesthetics

The study area consists primarily of large undeveloped tracts of land, most, of which is within the Mount St. Helens National Monument and Gifford Pinchot National Forest. Silviculture (i.e., activities related to the growth and harvesting of trees) is also a major land use in the study area. The Mount St. Helens National Monument area is the dominant visual feature in the landscape with its extreme evidence of the 1980 eruption.

The visibility of objects in a viewshed depends on topography; vegetation; size, color, and form of the object; and viewing distance. Significant views in the study area related specifically to views of the National Monument. There are three primary viewing locations for the National Monument: Coldwater Ridge Visitor Center, Johnston Ridge Volcanic Observatory, and Windy Ridge Viewpoint. While there are numerous other areas from which the National Monument can be viewed, these three locations, by far, attract the most visitors.

The GPNF Forest Plan developed by the U.S. Forest Service includes standards and guidelines designed to protect or enhance scenic and recreational values on National Forest lands. The Visual Quality Objectives (VQOs) described in the Plan should be considered for viewsheds seen from campgrounds, viewpoints, picnic areas, and other developed sites, as well as those seen from designated travel routes such as roads and rivers. Standards and guidelines for VQOs include measures to minimize the visibility of buildings, roadways, utilities, and areas disturbed by construction activity and timber harvesting.

Air Quality

The Southwest Clean Air Agency (SWCAA) is responsible for enforcing federal, state, and local outdoor air quality standards and regulations in Clark, Cowlitz, Lewis, Skamania and Wahkiakum counties. According to the SWCAA, air quality in the study area is good and does not exceed the National Ambient Air Quality Standards (NAAQS) or the air quality standards promulgated by the State of Washington. Sources of pollution in the study area are primarily associated with outdoor burning, wood stove use, and vehicle emissions. The State controls these sources of air pollutants through permitting for most outdoor burning, a wood smoke control program for wood stoves, and motor vehicle emissions inspections as part of vehicle registration.

The Washington Clean Air Act (RCW 70.94) includes requirements for the Departments of Ecology and Transportation to develop criteria and guidance for demonstrating and assuring that transportation plans, programs, and projects conform with the State's implementation plan for attaining and maintaining the NAAQS and meeting the requirements of the federal Clean Air Act (42 U.S.C. 7401) as amended. The Departments of Ecology and Transportation met this requirement by establishing requirements for evaluating transportation plans, programs, and projects for conformity with the purpose and intent of state implementation plans for air quality (Chapter 173-420 WAC). These requirements apply specifically to areas in the state that are non-attainment and maintenance areas with respect to the NAAQS (i.e., areas where levels of air pollutants exceed or have exceeded the NAAQS). Areas that are in attainment with the NAAQS, such as the study area for this project, are exempt from these requirements.

Noise

Noise sources associated with human activity in the study area include vehicles on federal, state, local, regional, and private roadways; mechanical equipment used in silviculture; and aircraft. The noises produced from these sources are generally intermittent and contribute to background levels; however, depending on distance from the noise source, noise from these sources could become a dominant feature in noise environment and may be considered a nuisance.

Visitors to the Mount St. Helen's National Monument and Gifford Pinchot National Forest are sensitive receptors to the various noise sources. Noise from roadway traffic, mechanical equipment, and aircraft could detract from the wilderness experience that some visitors to these areas expect to enjoy. Residences near roads and silviculture land are also sensitive noise receptors in the area. Some animal species in the area may also be sensitive receptors to noise.

The Department of Ecology established maximum permissible noise levels for three general types of land use: residential (Class A), commercial (Class B), and industrial (Class C) (Chapter 173-60 WAC). Class A lands include parks, camping areas, and other recreation areas; Class B lands include shops, restaurants, and hotels/motels; and Class C lands include silviculture property and warehouses. Table 6 provides the maximum permissible noise levels for these three general types of land use.

Table 6. Maximum Permissible Environmental Noise Levels (in Decibels)

Noise Source	Noise Receptor		
	Class A	Class B	Class C
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

Exemptions to these maximum permissible environmental noise levels are made for sounds created by motor vehicles, sounds originating from aircraft in flight, sounds originating from forest harvesting and silviculture activity, and sounds originating from construction equipment.

References

- ADFG. 2000. Fact Sheet Chum Salmon. Alaska Department of Fish and Game. Web page <http://www.state.ak.us/local/akpages/FISH.GAME/notebook/fish/chum.htm> chum
- Confederated Tribes of Grande Ronde. Photo of Nelson's checkermallow. <http://www.grandronde.org/nr/fw/MALLOW.HTM>
- OSU. 2000. Oregon State University Botany Department. Corvallis, Oregon. Web page www.orst.edu/dept/botany/
- Thomas, Ted. 2000. Botanist, U.S. Department of Fish and Wildlife. Personal Communication, August 2000.
- USFS. 2000. Final Supplemental Environmental Impact Statement (FSEIS) to amend the "Survey and Manage" mitigation measures of the Northwest Forest Plan. November 2000.
- USFS. 2000a. Personnel communication: D. Olson, Gifford Pinchot National Forest with C. Snead, HDR, Inc. December 27, 2000.
- USFS. 2000b. Letter from C. Lavendel, Forest Supervisor, Gifford Pinchot National Forest, to T. Buchholz, HDR, Inc. December 22, 2000.
- USFWS. 1993. Grizzly Bear (*Ursus arctos horribilis*) Recovery Plan. U.S. Department of the Interior, Fish and Wildlife Service, Portland OR.
- USFWS. 1993a. *Lomatium bradshawii* (Bradshaw's Lomatium) Recovery Plan. U.S. Department of the Interior, Fish and Wildlife Service, Portland OR.
- USFWS. 1993b. Endangered and Threatened wildlife and plants; the plant, Nelson's checkermallow (*Sidalcea nelsoniana*), determined to be a Threatened species. 50 CFR Part 17. Federal Register 58: 8235- 8243
- USFWS. 1994. Endangered and Threatened wildlife and plants; the plant, Water howellia (*Howellia aquatilis*), determined to be a Threatened species. 50 CFR Part 17. Federal Register 59(134): 35860-35864.
- University of Idaho. 2000. Information on Bull Trout Life History and Photo. Web page <http://www.uidaho.edu/~corn2742/>
- WDCTED. 1999. Historic Places in Washington: National Historic Landmarks, National Register of Historic Places, Washington Historic Register.

Washington State Department of Community, Trade and Economic Development, Office of Archaeology and Historic Preservation. Olympia, Washington.

WDOE. 2000. 1998 Section 303(d) List. Washington Department of Ecology.

WSDOT. 2000. Photo of Water Howellia. Washington Department of Transportation. Web page
<http://www.wsdot.wa.gov/eesc/environmental/Howellia.htm>

WDFW. 1998. Washington State Salmonid Stock Inventory Dolly Varden/ Bull Trout. Washington State Department of Fish and Wildlife. Olympia, Washington

WDFW. 2000. Wolf Population Status and Trends. Washington State Department of Fish and Wildlife, Wildlife Management Program. Olympia, Washington
web page www.wa.gov/wdfw/wlm/diversty/soc/graywolf.htm

WDFW. 2000a. DRAFT Washington State Recovery Plan for the Lynx. Washington State Department of Fish and Wildlife, Wildlife Management Program. Olympia, Washington

WSCC. 2000. Salmon and Steelhead Habitat Limiting Factors Water Resource Inventory Area 27 Lewis Watershed. Washington State Conservation Commission. Vancouver, WA

WSCC. 2000a. Salmon and Steelhead Habitat Limiting Factors Water Resource Inventory Area 26 Cowlitz Watershed. Washington State Conservation Commission. Vancouver, WA